REMARKS/ARGUMENTS

Amendments to the Claims

Basis for the amendment to Claim 6 can be found in the specification on page 5, lines 5 to 6 and 12 to 13. No new matter is added.

Basis for the amendment to Claim 9 can be found in the specification on page 5, lines 5 to 6 and 14. No new matter is added.

Basis for the amendment to Claim 10 can be found in the specification of page 5, lines 5 to 6 and 15. No new matter is added.

Claim Rejections

The Examiner has rejected Claims 6, 9, and 10 under 35 U.S.C. 112, second paragraph, as being indefinite for using the term "capable". The amendments to Claims 6, 9, and 10 have replaced the indefinite word "capable" with the positive limitation "which enables controlled radical polymerization through". The amendments should render Claims 6, 9 and 10 in allowable form regarding the 35 USC § 112 rejections.

The Examiner has rejected Claims 1 to 13 and 17 to 19 under 35 U.S.C. 103(a) as being unpatentable over Priddy et al (USP 5,721,320) or Boutillier et al (USP 6,255,402), or Bertin et al (USP 6,335,401), or Nicol (USP 6,262,179) each in view of EP 0892820.

As described in more detail in the application, Applicant claims a mass/solution polymerization process comprising polymerizing a vinyl aromatic monomer in the presence of a functionalized diene rubber having a solution viscosity of from 5 to less than 50 centipoise (cps) wherein the functional group on the rubber enables controlled radical polymerization such that the resulting grafted rubber particles have a broad monomodal size distribution.

Priddy discloses a bulk (mass) polymerization process comprising a rubber carrying a functionalized group enabling controlled radical polymerization with a vinyl aromatic monomer. Applicant's invention is a mass/solution polymerization process comprising polymerizing a vinyl aromatic monomer in the presence of a functionalized diene rubber having a solution viscosity of from 5 to less than 50 cps wherein the functional group on the rubber enables controlled radical polymerization.

Priddy does not disclose any viscosity requirements for the functionalized rubber. However, the Examiner cites Example 1 wherein a functionalized rubber having a Mw of 3930 is reacted with styrene. The Examiner concludes that it would be obvious to consider the claimed viscosity range can be obtained from the low molecular weight of the functionalized polybutadiene of Priddy. Applicant respectfully disagrees.

The present invention would not be obvious to one skilled in the art starting from Priddy because (1) Priddy does not disclose any solution viscosities requirements for the functionalized rubber, moreover teach or suggest Applicant's preferred solution viscosity range, (2) solution viscosity is dependent on several variables, not just polymer molecular weight, and (3) Applicant's process using a functionalized rubber with a specific solution viscosity range from 5 to less than 50 cps provides products with unexpectedly higher gloss.

The Examiner cites Example 1 in Priddy disclosing a functionalized rubber having a Mw of 3930. The Examiner suggests that the present invention claiming a functionalized rubber with a solution viscosity of from 5 to less than 50 cps would be obvious based on the low Mw of the functionalized rubber of Priddy's Example 1. As can be seen by Figure 1, of the Affidavit provided by Gilbert C. Bouquet, a relationship between Mw and solution viscosity for butadiene rubbers is graphically represented. The Mw/solution viscosity data points are from (1) the rubbers from the Examples of the present invention, (2) JP 4-88006 (Table 1, included with supplemental IDS) and (3) as determined by Dow for two commercially available butadiene block rubbers. As can be seen from the plot in Figure 1, a rubber with a Mw of 3930 (such as the rubber oligomer disclosed in Priddy) would have a solution viscosity significantly less than 5 cps. Priddy's low Mw rubber oligomer having a Mw of 3930 is clearly outside of the claimed invention. Further, there is nothing in Priddy which would motivate one skilled in the art to use a diene rubber with a significantly higher Mw such that the solution viscosity would be with in the claimed range of from 5 to less than 50 cps.

Priddy does disclose rubbers with a Mw of between 20,000 to 300,000, most preferably 100,000 to 150,000. However, because the viscosity of a rubber is a function of more than just its molecular weight (for example whether it is a

homopolymer, a copolymer (e.g., butadiene and styrene) and if it is a copolymer how much copolymer is present (percent styrene)) one skilled in the art could not predict whether the molecular weight rubbers of Priddy would fall within the Applicant's selected range. For example, Gilbert C. Bouquet provided the following data for two functionalized rubbers, one (Rubber 1) with viscosity within the range of the present invention and the other (Rubber 2) having a viscosity outside the range of the present invention. However, Rubber 1 having a lower viscosity has a higher Mw than Rubber 2:

Rubber	Mw, g/mole	Viscosity, cps
1	192,800	33
2	168,900	51

As can be seen, Rubber 2, a rubber having a Mw within the most preferred Mw range of Priddy does not fall within the claimed range of viscosity in the present invention. Thus, one can not assume or predict that a rubber with a certain Mw will have a certain viscosity based on Mw data alone.

Priddy does not disclose any viscosity requirements for its functionalized rubbers. Further, Priddy does not teach or suggest functionalized rubbers having a viscosity within the claimed range of 5 to less than 50 cps. To support that Applicant's selected range of solution viscosity of 5 to less than 50 cps for the functionalized rubber of the present invention is inventive Applicant refers to Comparative Example A in the Affidavit by Gilbert Bouquet. Comparative Example A is prepared by the same process as Examples 1 to 3 of the present invention. The functionality on the rubber in Comparative Example A is the same functionality as on the rubbers in Examples 1 to 3. The process of Comparative Example A is not an example of the present invention because the solution viscosity of the functionalized rubber is greater than 50 cps. The following table compares the superior higher gloss of the product from the process of Examples 1 to 3 to the lower gloss of the product from the process of Comparative Example A:

Example Com. Ex.	Initiator top R1 (ppm)	NDM top R1 (ppm)	NDM top R2 (ppm)	RPS (μm)	Intr.Gloss (%)
1	120	300	1000	0.45	82
	120	200	1000	0.39	88
	120	100	1000	0.42	84
	120	150	1000	0.38	87
	120	250	1000	0.39	90
	110	200	1000	0.39	89
	100	200	1000	0.40	89
2	100	200	1000	0.38	86
	100	150	1000	0.39	87
	100	250	1000	0.41	88
	100	100	1000	0.40	88
	100	50	1000	0.39	89
	90	50	1000	0.41	88
	90	0	1000	0.41	88
3	90	0	1000	0.40	87
	90	50	1000	0.41	87
	90	100	1000	0.40	87
	90	150	1000	0.42	86
	90	200	1000	0.42	84
	100	200	1000	0.41	85
	100	250	1000	0.46	82
A*	100	250	1000	0.61	67
	100	250	1200	0.63	64
	90	250	1200	0.66	66
	90	200	1200	0.59	69
	90	150	1600	0.75	61

*not an example of the present invention

Priddy does not teach or suggest Applicant's functionalized rubber with a solution viscosity of from 5 to less than 50 cps. Further, there is nothing in Priddy to motivate one skilled in the art to select a functionalized rubber with a molecular weight that would have a solution viscosity within the claimed range of 5 to less than 50 cps. Applicant asserts that the present invention as claimed is inventive and patentable in view of Priddy.

Boutillier discloses a polymerization process wherein a rubber carrying a functionalized group enabling controlled radical polymerization with a vinyl aromatic monomer, preferably the functionalized rubber has a Mw of from 100,000 to 500,000. Applicant's invention is a mass/solution polymerization process comprising

polymerizing a vinyl aromatic monomer in the presence of a functionalized diene rubber having a solution viscosity of from 5 to less than 50 cps wherein the functional group on the rubber enables controlled radical polymerization. As discussed hereinabove (and contrary to the Examiners assertion), one skilled in the art can not reliably nor accurately predict the solution viscosity of a rubber based solely on its Mw. The disclosed Mw range in Boutillier is even broader than Priddy. Further, as in Priddy, Boutillier does not disclose any viscosity requirements for the functionalized rubber. Moreover, Boutillier does not provide any motivation to select Applicant's functionalized rubber having a solution viscosity within the claimed range of from 5 to less than 50 cps from the disclosed functionalized rubbers with Mw from 100,000 to 500,000. Thus, for the same reasons discussed hereinabove for Priddy, Applicant asserts that Boutillier is also not relevant regarding obviousness of the present invention. Applicant believes the present invention as claimed is unobvious and patentable in view of Boutillier.

Bertin discloses a radical polymerization process wherein monomers can be polymerized in the presence of a stable free radical and a macroinitiator containing reactive side functions in order to produce grafted copolymers with control over the number and length of said grafts. Applicant's invention is a mass/solution polymerization process comprising polymerizing a vinyl aromatic monomer in the presence of a functionalized diene rubber having a solution viscosity of from 5 to less than 50 cps wherein the functional group on the rubber enables controlled radical polymerization.

Bertin's process is a method to graft block copolymers onto a polymeric backbone. Bertin does not disclose the use of a functionalized diene rubber. Further, Bertin does not teach or suggest a process comprising a functionalized diene rubber as a component. Applicant can not discern any relevancy of Bertin to the present invention. If the Examiner maintains her rejection in view of this reference, Applicant respectfully requests the Examiner point out specifically where Bertin discloses functionalized diene rubbers. Applicant believes the present invention as claimed is unobvious and patentable in view of Bertin.

Nicol discloses a process to polymerize a vinyl aromatic monomer and a rubber in the presence of a stable free radical to produce a vinylaromatic (co)polymer matrix with dispersed rubber particles. Nicol (like Bertin) does not

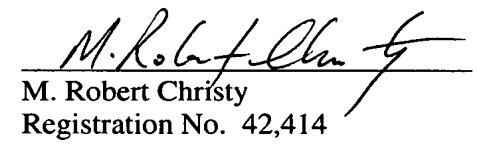
disclose the use of a functionalized diene rubber. Further, Nicol does not teach or suggest a process comprising a functionalized diene rubber as a component. Applicant can not discern any relevancy of Nicol to the present invention. If the Examiner maintains her rejection in view of this reference, Applicant respectfully requests the Examiner point out specifically where Nicol discloses functionalized diene rubbers. Applicant believes the present invention as claimed is unobvious and patentable in view of Nicol.

The Examiner has rejected Claim 19 (directed to an article or composition made from the rubber modified polymer produced by the process of the present invention) in view of Priddy, or Boutillier, or Bertin, or Nicol each in view of EP 0892820. EP 0892820 discloses a process for preparing modified polymers from vinyl aromatic monomers wherein the rubber has a bimodal particle size distribution. Applicant claims a mass/solution polymerization process comprising polymerizing a vinyl aromatic monomer in the presence of a functionalized diene rubber having a solution viscosity of from 5 to less than 50 centipoise (cps) wherein the functional group on the rubber enables controlled radical polymerization such that the resulting grafted rubber particles have a broad monomodal size distribution. EP 0892820 discloses rubber-modified polymer compositions comprising bimodal rubber particle size distribution. The present invention requires a broad monomodal rubber particle size distribution. Applicant asserts there in no possible way one skilled in the art could combine one or more of Priddy, or Boutillier, or Bertin, or Nicol (none of which are relevant as discussed hereinabove) with the bimodal rubber composition of EP 0892820 to arrive at Applicant's process to make a rubber modified polymer with a broad monomodal rubber particle distribution. Applicant believes the present invention is unobvious and patentable over Priddy, or Boutillier, or Bertin, and/or Nicol in view of EP 0892820.

CONCLUSIONS

In view of the preceding amendments and remarks, Applicant believes all grounds of rejection have been fully traversed and Applicant's amended Claims 6, 9, and 10 and previously amended Claim 1 and original Claims 2 to 5, 7 to 8, 11 to 13, and 18 to 19 are patentable in full. Accordingly, their reconsideration and allowance at the earliest possible convenience is courteously solicited.

Respectfully submitted,



M. Robert Christy
Registration No. 42,414
Phone: 989-636-0413

P. O. Box 1967
Midland, MI 48641-1967

MRC/mlv